Reflections

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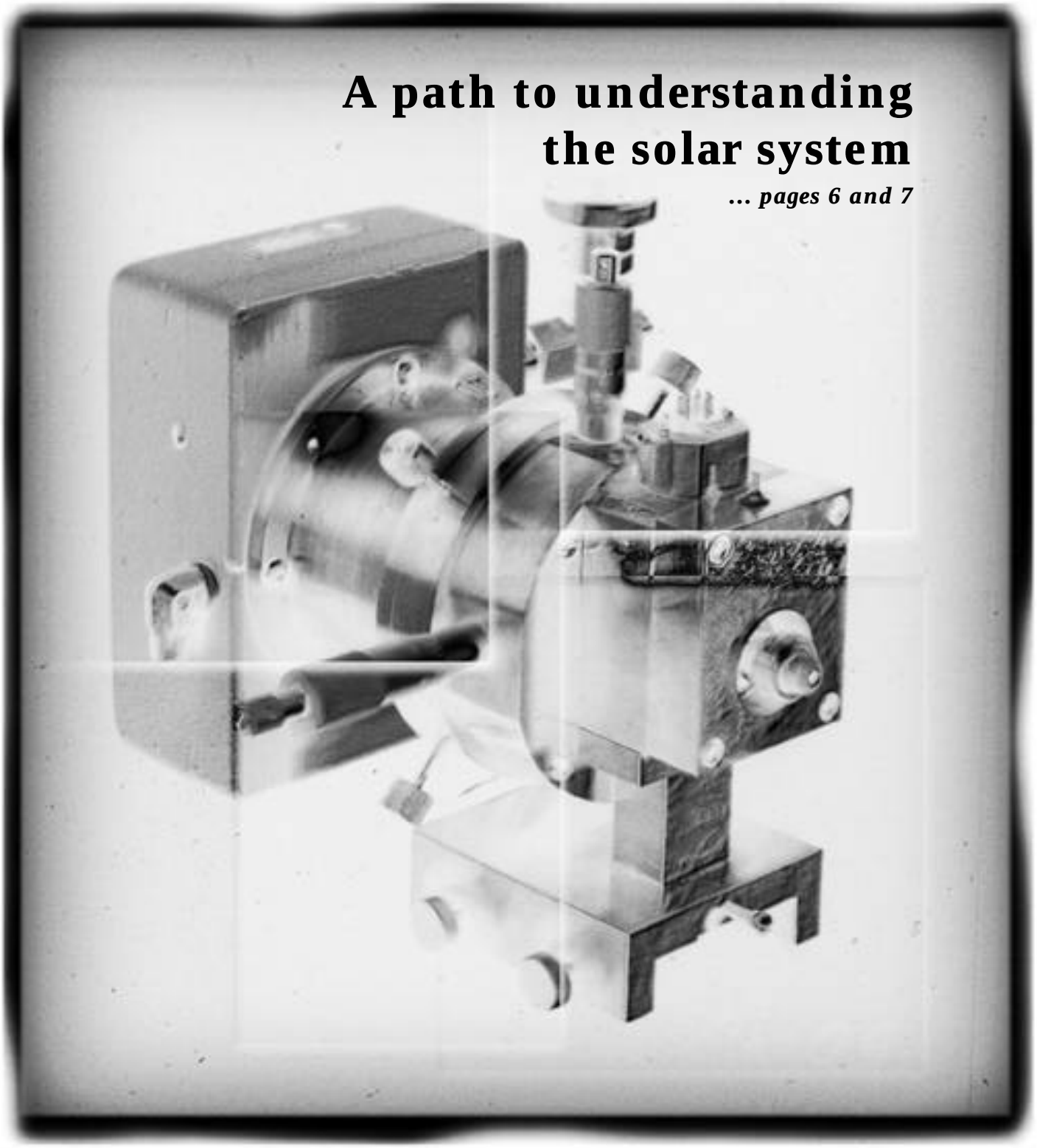

A path to understanding the solar system

... pages 6 and 7

A Department of Energy/University of California Laboratory

Inside this issue ...

Cover illustration by Edwin Vigil

Reflections

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editor's journal

There's something about spring

Spring. The welcome signs of it are everywhere. And despite the past few months being the driest and warmest winter months in recent years, there's something nice about April and the dawning of the official spring season. Maybe it's that feeling of renewal, promise or positive change that spring brings each year — blooming flowers, budding trees, nesting birds, daylight savings, new construction, etc.

However, one sign of the season that does not signal positive change is National Equal Pay Day. Observed in April, this national event notes the day on which the average woman's pay for work performed in the previous calendar year finally catches up to a man's salary for that same time period. Many people across the country, both women and men, are concerned about the continuing discrepancy in wages between men and women, and are looking forward to the time when there no longer will be a need for Equal Pay Day.

On average, women in the United States today still earn a fraction of what men earn each year for comparable work. Researchers say this difference in annual salaries affects families as well as individual women and has long-term financial implications. For not only does pay inequity limit one's current economic power, it affects future income and lifestyle. Low salaries usually mean low retirement income, and many women and couples depend solely on this retirement income for their "golden years."

On April 8, Equal Pay Day will be observed at the Laboratory for the second consecutive year. This observance primarily will be in the form of information sharing (see the article on Page 5). Equal pay for comparable work and what this means for women has drawn a lot of discussion recently, and some interesting material about the pay-equity issue is available on the World Wide Web. The following are some of the web sites:

• *http://www.the-scientist.library.upenn.edu/yr1997/apr/silverman_p1_970414.html* — A report on a National Science Foundation study of employment issues facing women and minorities that breaks down the wage differentials

http://www.bpwusa.org/ — Home page for Business and Professional Women/USA, an advocate for working women

http://www.iwpr.org/ — Home page for the Institute for Women's Policy Research, a nonprofit, scientific research organization

http://www.wiser.heinz.org/mainpage.html — Home page for the Women's Institute for a Secure Retirement, an independent nonprofit organization devoted to educating women about retirement issues

http://www.ILR.cornell.edu/library/e_archive/glassceiling/ — Information about and from the national Glass Ceiling Commission, including reports and documents about wage inequity and other issues

http://www.womenandfamilities.org/workandfamily/workplace/paydiscrim/equalpayact.htm — Information about the 1963 Equal Pay Act

And speaking of articles in this month's issue, take a look at the Spotlight piece on Page 12. Lab employee Tim Haarmann, an entomologist in Ecology (ESH-20), talks about how he shared his beekeeping skills with farmers in Mozambique — now that's what I call reaching out. Also featured in this month's "Reflections" is an article on Page 6 about a Lab-developed device for remotely analyzing both the chemistry and mineralogy of a sample that may lead to a greater understanding of our solar system.

Enjoy the issue and the season. ... And let's all hope that National Equal Pay Day soon will drop from the rites of spring.

Lab's new counterintelligence chief emphasizes prevention, not punishment

by Kathy DeLucas

He's the top cop on the Lab's counterintelligence highway, but Ken Schiffer hopes he won't be giving out any tickets. Schiffer heads up the Internal Security office (ISEC) and is responsible for counterintelligence, operational security, and foreign visits and assignments.

Schiffer came to the Lab after spending 30 years working in counterintelligence for the Federal Bureau of Investigation. He's studied Chinese in an intense language school and has worked in Indianapolis; Washington, D.C.; Quantico, Va.; and San Diego.

During his first year at the FBI, Schiffer made quite an impression on then-FBI Director J. Edgar Hoover. Schiffer has Hoover's autograph on a letter of admonishment for a vehicle crash. The car crash also resulted in Schiffer having to pay for the auto repair, receiving no annual raise and being relocated to the FBI field office in D.C.

"At the bureau, I soon learned that if you take care of the little things, the big things will follow," he said.

Schiffer never got to meet Hoover, although it was required that every new agent meet the FBI director. "I was playing hockey and I got into a fight, which happens often during hockey games, and I took a stick to the chin and had six stitches," Schiffer explained. The training instructor didn't know how to break the news to Hoover that one of his new agents had lost a fight, so they removed the stitches and the cut soon became infected, leaving Schiffer laid up on the day he was supposed to meet with Hoover.

Schiffer's most notable espionage case involved Larry Chin, a Central Intelligence Agency employee who was arrested, tried and convicted of espionage in the late 1980s. Schiffer was the supervisor of the investigating squad that brought Chin down.

"It's significant, because most espionage cases never come to trial," Schiffer said.

In San Diego, Schiffer heard about the Los Alamos job opening from a friend. His first day at the Lab was last Dec. 14, and he is enjoying the job and Southwest way of life.

Ken Schiffer, the new head of the Lab's Internal Security office, and his quarter horse, Bo Didley, work on their roping skills at his "spread" in Nambé. In his spare time, Schiffer competes in team roping events at rodeos. *Photo by LeRoy N. Sanchez*

Schiffer and his wife, Judy, live in Nambé and have two grown sons who live in Virginia. He has two quarter horses and enjoys participating in rodeos, competing in team roping events.

Schiffer's goal for the ISEC office is to prevent disclosure of sensitive or classified information.

"We're not the state highway cops of counterintelligence giving tickets to violators. It's our job to prevent it from happening at all." he said.

For too long the three areas that he is responsible for have been separated, he said. Operational security and foreign visits both play into the bigger picture of counterintelligence. "Counterintelligence is the effort to protect information, whether it is classified, sensitive or proprietary, from being compromised by people or foreign countries that shouldn't have it," he said.

ISEC's purpose is not to be a big brother or a watchdog, but to help researchers and Lab employees protect the information. For example, Schiffer plans to hire a team leader for foreign visits who will work with hosts of the foreign nationals to make sure proper approval procedures have been followed and access limitations are in place. His ISEC team also provides help to employees who are traveling to foreign countries.

"We are able to provide counsel to Lab employees before and after they travel overseas as to what that country's information collection priorities are, and what to be careful of," he said. "We're here to help Lab employees so they're not taken advantage of."

Schiffer noted that he inherited an extremely competent staff of counterintelligence officers: Terry Craig, Lori Hutchins, Erika Arendt, Robert Vrooman, and Gerald Brown; foreign visits and assignments specialists Veronica Martinez and Ruth Ann Vargas; operational security specialists David Bibb and Karen Warthen; and especially his secretary Lilia Jimenez, who keeps him on track and has made his transition from the FBI to the Lab much easier and smoother.

reaching out

Electronics class helps Lab, community

by John A. Webster

Instructor Gerry Verduga, standing, oversees the work of students in the Electronic Packaging Design Technology course at Northern New Mexico Community College, which was set up with the help of the Lab. The students, from left to right, are Chris Martinez, Marvin Roybal and Amos Gutierrez. *Photo by LeRoy N. Sanchez*

What began in the spring of 1998 as a possible solution to a critical need for Space Instrumentation and System Engineering Capabilities (NIS-4) became a course at Northern New Mexico Community College six months later.

Along the way, the proposal for the course was accepted by the college, a curriculum was developed and approved, a teacher was hired, space was found at the college, a company was persuaded to donate software, computer workstations were found and moved into place, the Los Alamos National Laboratory Foundation was convinced to help with the funding, and students were enrolled.

"This has been a real team effort," said Olivia Martinez of the Community Relations Office (CRO-1). "A lot of people at the Lab and at the college worked a lot of hours to bring it off."

The course, Electronic Packaging Design Technology, is designed to train people in the fundamentals, from design through production, of printed circuit boards and microelectronic components, the building blocks of electronic systems typically assembled by NIS-4 for satellites and other uses.

"This discipline is critical to our operations, and without it we can't function efficiently," said Mel Duran, group leader at NIS-4. "For example, FORTÉ (a Lab-developed satellite launched last year) would have cost a lot more money — and time — if we didn't have this capability. We're able to accomplish these kinds of missions because we have this kind of capability."

Gary Smith, a team leader in NIS-4 who wrote the course curriculum with Duran, said the group became concerned in recent years because it was not able to replace layout design workers who were retiring for at least two reasons: Schools did not provide the training, and industry, which also is suffering from a lack of trained workers, was paying more for these capabilities than the Lab could afford.

"We tried several approaches to train people, but they would leave for industry," Smith said. "Mel and I figured that we needed to do something new, so last spring we began looking at helping set up a local training program."

That's where Martinez, who works at CRO's Outreach Office in Española, came in.

"I got a call one day asking for help in partnering the Lab with the college for workforce development because NIS-4 needed these types of workers," she said. "I thought it seemed like a good fit, so I got in touch with Jose Griego (the dean of instruction) and Tony Sena (chairman of the Science and Engineering Department), described the proposal and found that they were receptive."

"The college's mission is to provide training to the community," said Jeff Toomey, an instructor at the college who helped set up the program. "We want to provide the best training we can, and this was a good opportunity to do just that."

The Laboratory Foundation was approached and agreed to match funding provided by the Nonproliferation and International Security (NIS) Division for scholarships. Mentor Graphics of Oregon provided software packages worth more than $800,000. While program officials were trying to negotiate an arrangement with industry to provide workstations, the Lab agreed to provide 10 workstations on a "loaner" basis. Six students completed the first semester in the fall of 1998, and 14 enrolled for the current semester.

The two-year course, which leads to an associate degree, provides instruction in basic electronics, electronic drafting methodology, printed circuit board design, integrated circuit layout design, and manufacturing processes and materials. The students learn to interpret circuit diagrams and schematic drawings, translate them into designs for physical structures and develop the data and information needed to fabricate circuit boards or electronic components.

"This technology is moving fast and becoming very complex," said course instructor Gerry Verduga, a Lab retiree with 35 years experience in the field and a degree in electronics technology from Northeastern University in Boston. "It used to be that companies could hire high school graduates and train them, but now they can't afford to provide all the training that's required."

The course, which is the first of its kind in the country, uses state-of-the-art equipment, "just like they have in industry," Verduga said.

Added Duran, "These students are going to have more of the fundamentals, background and ability to visualize broad applications than senior people working in the field now."

NIS-4 hopes to be able to hire some of the graduates. "We can't hire all of them, but we sure can use some of them," Smith said. "We're hoping that they will want to work at the Lab and stay in the local area."

Martinez said the course meets a need for job training that was identified by Española community leaders in a recent survey commissioned by CRO. She said the effort involved in setting it up could serve as a model for other community-outreach programs by the Lab.

Pay inequity affects all working families

by John A. Webster

The average working family in New Mexico loses nearly $5,000 a year as a result of the difference in wages earned by men and women, according to data compiled by a national policy research organization.

The difference between the average annual salaries of men and women during their working careers is emphasized in retirement, where women receive about half the average pension benefits of men.

"Obviously, providing a fair wage for women would benefit the family as a whole," said Gloria Mirabal of Nuclear Systems Design and Analysis (TSA-10). "It also would help prevent women from living in poverty when they reach retirement age."

"Pay equity is the fair thing to do," added Mary Barr of Advanced Technology (NMT-6). "People who work at jobs that are comparable in complexity and in value should receive comparable pay."

To raise awareness of pay inequity and provide information about the issue, the local Pay Equity Coalition will set up an informational booth outside the Otowi Cafeteria from 11 a.m. to 1:30 p.m. on Thursday, April 8, which is National Equal Pay Day.

The date, which is being marked for the second year at the Laboratory, is the day when a woman's salary for the period beginning Jan. 1, 1998, finally catches up to a man's salary for the 1998 calendar year.

Members of the coalition will provide materials about pay inequity, saving for retirement and other issues; respond to questions; and distribute buttons showing a torn dollar bill and asking: "Where's My 26¢?" The question refers to the fact that women earn an average of 74 cents for each $1 men earn. Other buttons will ask: "Where's My 37¢?," referring to the pay difference between white males and African-American women, and "Where's My 46¢?," for Hispanic women.

The coalition — composed of the Laboratory's Employee Advisory Council, the Diversity Working Groups, the New Mexico Commission on the Status of Women, the League of Women Voters, MANA del Norte, the American Association of University Women and the Business and Professional Women — is also sponsoring a talk at noon Monday, April 19, in the Otowi Cafeteria side dining rooms.

Karalyn Schmidt, executive director of the New Mexico Women's Foundation, an Albuquerque-based organization that helps fund programs for women and girls across New Mexico, will speak on the impact of pay inequity on long-range financial security.

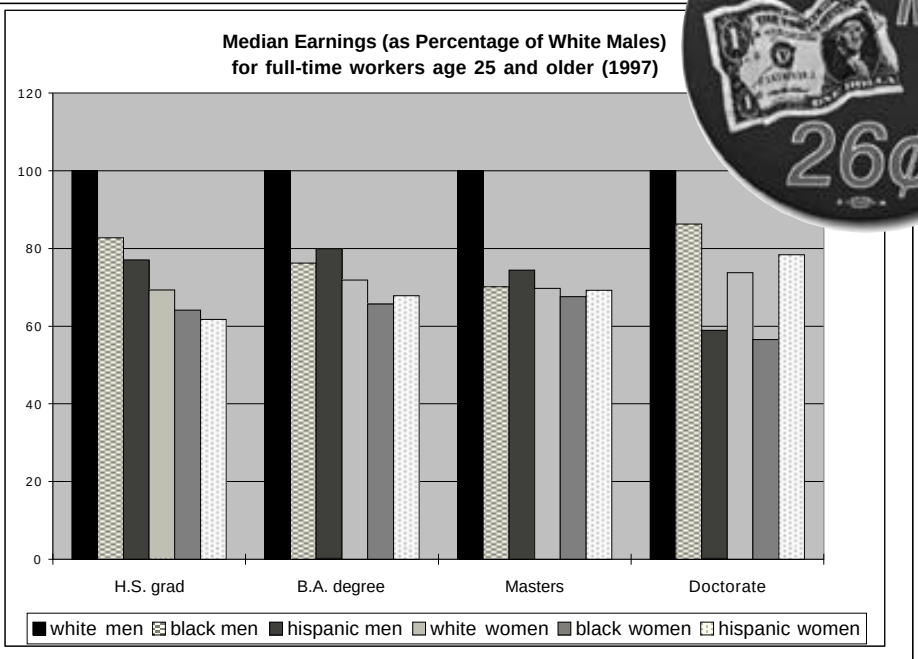
Mirabal, who represents MANA del Norte, said the long-range impact of pay inequity is a major theme for the coalition this year. Studies show that women need more money for retirement because they live an average of five years longer than men, she said, but "they usually end up with far less" because they earn less and often leave the workforce at times to care for children or aging parents.

The loss of $4,760 a year to New Mexico working families is included in a recent report by the Institute for Women's Policy Research and the AFL-CIO. The report says New Mexico ranks 42nd in the nation in the size of the wage difference.

The issue of pay equity encompasses a number of facets in addition to equal pay for equal work, said Barr, a member of EAC. They include comparable worth, stereotyping, career opportunities and the glass ceiling that constrains women from advancing at higher levels of management.

Comparable worth, Barr said, differs from equal pay for equal work in that it takes job complexity and value into account. For instance, she said, the salary range for TEC-3 (unskilled to semi-skilled technicians) at the Lab is similar to the OS/GS-5 level. The OS/GS position, however, requires more complex duties with significantly greater liability and impact on the organization and has fewer options for career advancement.

Mirabal and Barr said individuals can do several things to help address pay-equity issues. They include examining their tendency to stereotype others, persuading managers to work harder on "pushing the system" for their employees, overcoming a reluctance to discuss salaries with co-workers, taking advantage of educational and career development opportunities, and being more assertive on job evaluations when it is warranted.



This chart is based on data collected by the National Council on Pay Equity.

CHEMIN: A path to understanding the solar system

by Todd Hanson

It's a bit more than simple coincidence that David Bish and his team in Geology and Geochemistry (EES-1) chose the name CHEMIN for their prototype analytical instrument. In French, the word "chemin" means path, and by all indications, the CHEMIN instrument may very well be the path to a greater understanding of our solar system.

Named CHEMIN to reflect its ability to determine both the CHEmistry and MINeralogy of a sample, the miniaturized X-ray diffraction/X-ray fluorescence instrument is designed to remotely analyze both the elemental composition and constituent mineralogy of fine-grained soils, rock and even ice samples. Given the opportunity, the CHEMIN instrument will find its way to other planets and beyond.

There are roughly 100 naturally occurring elements in the universe. These elements can combine to form more than 3,800 known minerals. The genesis and histories of the planets, asteroids and comets are reflected in their constituent minerals. Origins of intense pressure and extreme temperatures are intertwined with histories of sedimentation, metamorphism, collisions and weathering to help create the complex structure of the solar system. CHEMIN is designed to help unravel that structure.

According to geologist David Vaniman of Geology and Geochemistry (EES-1), "Scientists have been sending instruments to planets and other bodies in our solar system for many years, but none of that instrumentation could do both chemical and mineralogical analysis. Using the CHEMIN instrument, not only can we now determine what elements are present in a mineral, rock or ice sample, we can analyze the sample's crystalline structure or mineralogy. "That's helpful because knowing the crystalline structure can tell us how the sample's elements first came together and if they have been changed. It gives the sample's life history, if you will."

'It gives the sample's life history.'

A comparison of the tiny X-ray tube that will be used in the next-generation CHEMIN instrument and an X-ray tube from a commercial diffractometer. *Photo by Todd Hanson*

CHEMIN provides chemical information similar to that provided during last year's Martian rover mission, and it also provides data on the types of minerals present in a powder sample using a technique known as X-ray diffraction. CHEMIN uses a single CCD (a charge-coupled device similar to those used for video cameras) as a detector to determine chemistry and mineralogy at the same time.

Geologists use information on the particular types of minerals present to determine how rocks formed and what processes have shaped planetary surfaces. Bish explains why having both chemical and mineralogical information is so important.

'In some cases this will be the best information you can collect ...'

"If a sample containing only silicon and oxygen were chemically analyzed, we might know, for example, that the material's chemical composition is SiO_2. However, a number of different minerals have this same composition. One of them is quartz, which is quite common on Earth's surface; another is opal, which is comparatively rare. With chemical information alone, it would be almost impossible to determine which form of SiO_2 the sample represents."

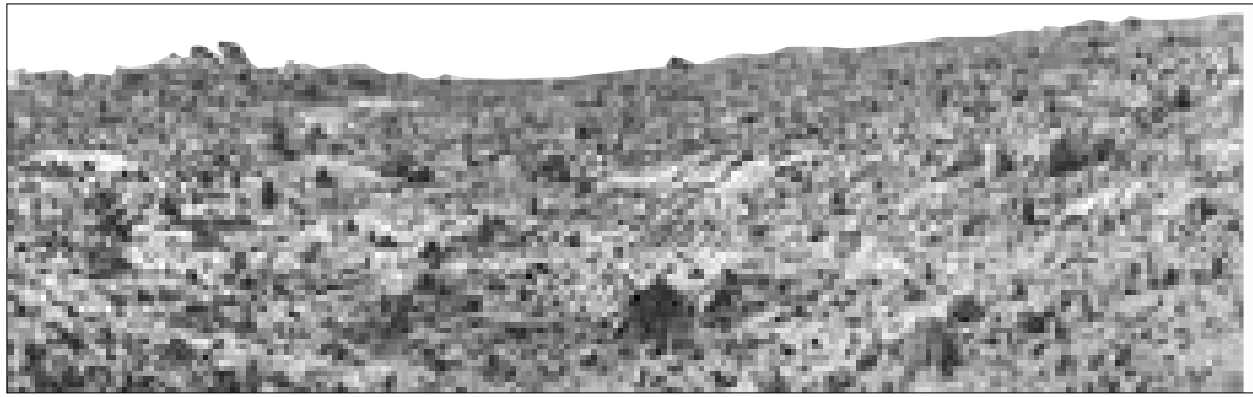
Geologist Steve Chipera of EES-1 echoes the thought. "In some cases this (CHEMIN data) will be the best information you can collect because any planetary, asteroid or cometary body with mineral constituents that contain water, sulfur or halogens requires X-ray diffraction in addition to chemical analysis for adequate understanding of origin and evolution."

What makes CHEMIN special, however, is not just its ability to analyze composition and mineralogy of a particular sample, but the fact that it's so small. Designed to fit into a spacecraft or onto a planetary rover, a flight-ready CHEMIN would weigh less than a kilogram, be about the size of a soda can and consume only 2 watts of power. Overall, flight-instrument data-collection times of one to two hours are expected, with sample collections systems that could hold more than 25 samples. In other words, this small instrument could gather a great deal of important data in a relatively short period of time.

Near the beginning of the project, there had been some concern about the quality of the data collected by a CHEMIN device, but extensive testing has shown that the instrument is capable of gathering data with the quality of laboratory diffractometers 50 times as large. This ability to gather high-quality data with such a compact and lightweight instrument is finding many uses. In fact, not only could it be used to answer questions about extraterrestrial mineralogy, it could be used on Earth in field applications, such as geological sampling at remote, contaminated or otherwise dangerous sites, that require a small, low-power instrument.

CHEMIN is the result of years of collaborative work by scientists at the Laboratory, NASA's Ames Laboratory and the Jet Propulsion Laboratory. More information can be found at the project World Wide Web site at http://www-geo.lanl.gov/chemin/chemin.html.

Researchers Steve Chipera, left, and Dave Vaniman examine the CHEMIN prototype device. *Photo by LeRoy N. Sanchez*



A view of the Martian surface taken on NASA's recent mission to the red planet. On such a mission, CHEMIN not only could provide chemical analysis, it also could analyze the types of minerals present in the Martian soil.


Beverly Hartline

Hartline named SNS project director

Beverly Hartline recently became the new project director for the Spallation Neutron Source at the Los Alamos Neutron Science Center (LANSCE) Division. The SNS project — a collaboration of the Laboratory and Oak Ridge, E.O. Lawrence Berkeley, Brookhaven and Argonne national laboratories — is a major Department of Energy initiative designed to provide a state-of-the-art, intense pulsed neutron source for neutron scattering experiments and material science studies. The linear accelerator portion of the project is being executed at LANSCE.

Hartline was associate director and project manager at the Thomas Jefferson National Accelerator Facility in Virginia (formerly the Continuous Electron Beam Accelerator Facility) before taking the position at the Lab, though she actually was on loan to the White House's Office of Science and Technology the past two years, serving as assistant director for Physical Science and Engineering. She has extensive experience in the areas of research and project management; strategic, institutional and project planning; performance measurement; and science education, among other areas.

Hartline received her bachelor's degree in chemistry and physics from Reed College in Oregon and her doctorate in geophysics from the University of Washington. Her membership portfolio includes the American Association for the Advancement of Science, American Geophysical Union, American Physical Society, National Science Teachers Association and American Women in Science. She also is a member of two committees and a roundtable for the American Association of Physics Teachers, U.S. Geological Survey and National Research Council.

Lab affiliate wins presidential award

Tonya Kuhl, a Laboratory affiliate, recently received the prestigious Presidential Early Career Award from the National Science and Technology Council. The NSTC coordinates the multi-agency science and technology policy-making process and implements and integrates the president's science and technology policy agenda across the federal government.

The award, begun in 1996, honors outstanding young scientists and engineers who show exceptional potential for leadership in their respective fields and is the highest honor that can be given to them by the U.S. government. Kuhl and the other winning researchers also received funding for their projects for five years.

DOE is one of several government entities participating in the program. Winners are selected from each participating agency. Neal Lane, assistant to the president for the Office of Science and Technology Policy, presented the award to the winners during a ceremony held Feb. 10 at the Old Executive Building in Washington, D.C.

"I've known Dr. Kuhl a few years, and I've been very impressed with her ability to define and tackle a problem with unbridled enthusiasm and determination," said Greg Smith, acting deputy group leader of the Manuel Lujan Jr. Neutron Scattering Center (LANSCE-12) who nominated Kuhl for the 1998 DOE Defense Programs Early Career Scientist and Engineer Award. Upon winning that award, her name was forwarded as a DOE nominee for the NSTC's Presidential Early Career Award. "She was a candidate whom Los Alamos could be proud of in terms of her past


Tonya Kuhl

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Testing and Materials society honors two Laboratory employees


Torsten Staab


John Elling

Torsten Staab and **John Elling** of Automation and Robotics team (ESA-EPE) were recently honored by the American Society for Testing and Materials (ASTM).

They were recognized for developing the "Laboratory Equipment Control Interface Specification (LECIS)," which recently received an official standard designation by the ASTM. This new standard defines a uniform remote control interface for laboratory equipment.

Staab received a "Diplom Informatiker (FH)" degree in computer science from the Fachhochschule Wiesbaden, University of Applied Sciences in Wiesbaden, Germany, in 1996. He received his master's in the computer science program at the University of New Mexico in 1998. He joined the Lab in June 1996 with Engineering Science and Applications Measurement Technology (ESA-MT).

Elling holds a bachelor's and master's degree in chemistry from Bucknell University and a master's degree in business from the Anderson School of Business at UNM. He received a doctorate in Analytical Chemistry from the University of Wisconsin. Elling came to work for the Lab in 1991 with Mechanical Electronic Engineering (MEE-3).

March employee service anniversaries

30 years
Elfino Armijo, MST-7
Eluterio Garcia, ESA-WMM
Gene McCall TSA-DOD

25 years
Sheila Armstrong, X-NH
Steffanie Coonley, EES-8
Arthur Dana, X-NH
Joseph Ivie, LANSCE-7
Rebecca King, NIS-3
Richard Krajcik, X-DO
Kenneth Kutac, F-9
Ronald Martinez, CST-6
Viola Martinez, LANSCE-6
David Moir, DX-8
J.J. Mortensen, CRO-2
Jose Pacheco, LANSCE-2
Don Parkin, MST-CMS
Kathryn Pfeufer, DX-5
Amelia Roybal, NIS-4
Jimmy Roybal, CIC-9
J. David Schneider, APT-TPO
David Sharp, T-13
Robert Shurter, LANSCE-1
Bryan Travis, EES-5

20 years
Anthony Burris, NIS-IT
R. Wayne Hardie, TSA-4
Dan Knobeloch, EM-DO
Betty Martinez, F-7
Bruce Ormond, ESA-WMM
Warren Pierce, LANSCE-3
Karen Rodriguez, CIC-1
Dan Winske, X-PA
Merri Wood, X-TA
Robbie York, NIS-6

15 years
Christella Baca, HR-1
J.M. Bustamante, NMT-7
Jeanne Bowles, P-25
Mary Campbell, LS-3
David Chamberlin, NIS-9
Rose Des Georges, NIS-3
Robert Gonzales, NMT-4
Charles Harvier, PM-3
Jill Hefele, ESA-WE
Karen Hench, NMT-4
Carl Hoth, NMT-4
John Longer, ESA-FM-ESH
Richard Lohsen, DX-3
Marcia Lujan, HR-5
Ralph Lundin, NMT-5
Susie Martinez, CIC-10
Gilbert Montoya, EM-SWO
David Neal, T-CNLS
Ralph Nelson Jr., X-CI
Nicholas Olivas, NIS-4
Dale Osborn, BUS-3
Jane Poths, CST-7
Wayne Scoggins, ESH-10
Michael Stevens, MST-8
James Toevs, CISA
Robert Tokar, NIS-1
W. Rick Velasquez, ESH-19
Henry Vigil, BUS-2

10 years
Rosella Atencio-Gerst, HR-1
Charryl Berger, CIT-PO
Malti Bhatia, CST-9
Nancy Boat, NW-EP
Vicki Brown, CIC-6
Charles Calef, T-10
Elda Childers, BUS-5
Lorraine Dominguez, ESA-DE
Eduardo Estrada, ESH-1
Patricia Granich, TSA-DO
John Hall, CIC-12
Monika Hoeberling, NIS-5
Tommy Hook, CIC-10
Starr Johnson, ESA-WMM
Elizabeth Jones, ESH-17
Larry Jones, EES-8
Martin Koby, CST-9
Deborah Kubicek, TSA-5
Seledon Martinez, ESH-1
Leslie Morgeson, CIC-15
Richard Morley, CST-7
Susan Radzinski, NMT-1
Rick Romero, PM-2
Glenda Rougemont, BUS-6
Daniel Roybal, NIS-5
Wanda Roybal, HR-5
Jill Shearer, CIC-2
Cindy Sievers, TSA-5
Susan Spach, NMT-5
Gerald Tafoya, BUS-3
Aquilino Valdez, NMT-2
Duane Valdez, LC
William Waganaar, P-24
Kathleen Wright, CST-11

5 years
Geoffrey Chesshire, CIC-19
Warren Finch, BUS-5
Rosalie Hammon, CST-4
Ralph Hinde Jr., ESA-EPE
Jerome Kunzman, ESH-2
Mavis Lin, CST-7
Kenneth McClellan, MST-8
Eric Nelson, X-PA
Jon Reisner, EES-8
Linda Rowton, CIT-ES
John Tucker, S-DO
Tracy Valdez, AA-2
Min Yan, CIC-12

Lab affiliate wins ...

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accomplishments and future promise in science," Smith added.

Kuhl, a chemical engineer at the University of California, Santa Barbara, has been performing her experiments at the Manuel Lujan Jr. Neutron Scattering Center since 1991. She also is a member of the LANSCE Users Group Executive Committee.

"This is just incredible," said Kuhl regarding the award and grant money. "The extra funding will allow my research to progress further than I anticipated. It will also continue and strengthen the collaboration and research program between UCSB and LANSCE and enable us to try more high-risk but high-potential projects. I am very excited."

The focus of her work currently is on developing new "smart materials" and surface coatings, manipulating materials' characteristics by attaching thin films to their surfaces. These coatings then can be used as corrosion inhibitors, adhesives, lubricants or wear-resistant coatings. Kuhl uses the Lujan Center to study these materials.

Kuhl received her bachelor's degree in chemical engineering from the University of Arizona in 1989 and her doctorate in the same field from UCSB in 1996.

In Memoriam

Michael Berger

Michael Berger, deputy program director in the Environmental Management (EM) Program Office, passed away Feb. 9. Berger had been with Lab for 24 years in various scientific and administrative capacities. He had a long history of dedicated service to his profession and the Laboratory. During his tenure with the Lab, he served as a leader of the Environmental Management Science Program's Extraction and Separation of Radioactive and Hazardous Chemicals Team and was on the Make or Buy Team of the Laboratory Leadership Council's Resource Working Group. Most recently, he had been appointed to the Governor's Blue Ribbon Task Force for Water.

Robert S. Massey

Robert S. Massey, staff member in Space and Atmospheric Science (NIS-1), passed away unexpectedly March 5. Massey came to the Lab in 1976 to work in the magnetic fusion program. His first assignment was with the Q-machine and Basic Experimental Plasma Physics (CTR-1). Later, as a member of SST-7 (later NIS-1), he served as both section leader and team leader. Massey made significant contributions to many Laboratory activities including the Artemis, Roster and V-sensor programs. He was lead scientist and project leader for the W-Sensor program, principal investigator for the Blackbeard Project and a central figure in the development of the FORTÉ satellite. He won a Laboratory Distinguished Performance Award as a member of both the Global Positioning System Team in 1992 and the FORTÉ Project Team in 1997.

"Science at Home" is a publication developed by Science Education (STB-SE) to interest children, particularly those in grades four through eight, in science through hands-on activities. We are reprinting experiments from the book, along with other scientific activities, for employees to share with their families, or just to enjoy themselves.

The quicker picker upper

Has this ever happened to you? You are sitting at a table doing your homework, drinking your favorite beverage. While reaching for a book, you accidentally knock over your drink, which spills all over the table. Thinking quickly, you rip a sheet of paper out of your notebook to soak up the liquid, but instead of absorbing the moisture, it just pushes it around. You have to go and get a paper towel to clean up the mess.

Why is it that a paper towel will soak up water, but writing paper won't? Why is it that sometimes one towel will do the job, while other times, it seems to take half of a roll? Of course, the size of the spill has something to do with it, but there is a second factor as well — the absorbency of the paper. Simply put, the absorbency of a material is a measure of how much moisture it can hold before it becomes saturated or filled up with liquid.

Manufacturers of paper towels, napkins, toilet tissue and even disposable diapers are constantly claiming that their products are more absorbent than their competitor's products. In this activity you will scientifically compare the absorbency of several different brands of paper towels to do your own consumer test. You will test each brand for its speed of absorbency and the volume, or amount of liquid, it can hold. As with all scientific experiments, it's important that you measure as accurately as possible and keep the conditions exactly the same each time you do it. In this way, you eliminate some of the variables that could give false results.

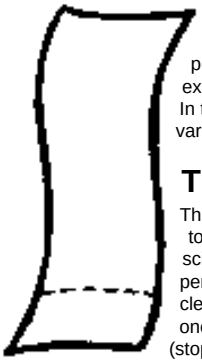


diagram 1

The stuff you'll need

Three different brands of paper towels, one sheet from each roll; scissors; magnifier; ruler; ball point pen, *not* a water-based marker; clear drinking glass (a tall narrow one is best); water; timing device (stopwatch or clock with a second hand); data sheet.

Here's the plan

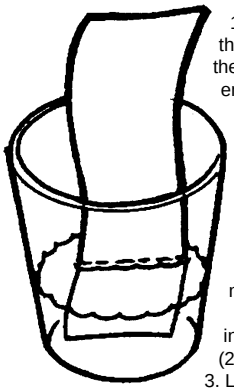


diagram 2

1. Closely examine each of the three brands of paper towel with the magnifier and note any differences. Which is thicker? Tear a small piece off each and look at the fuzzy little fibers that make up the towel. How are the paper fibers spaced? Which brand seems to have the most holes? Mark down your observations on the data sheet and predict which one will be the most absorbent.

2. Cut two strips of paper towel 1 inch wide by 11 inches long (2.5cm by 28cm) from each brand.

3. Label each strip at the top with its brand name. Set one strip from each brand aside. Draw a line across each of the remaining strips, 1 inch (2.5cm) from the bottom. This will be your water line (diagram 1).

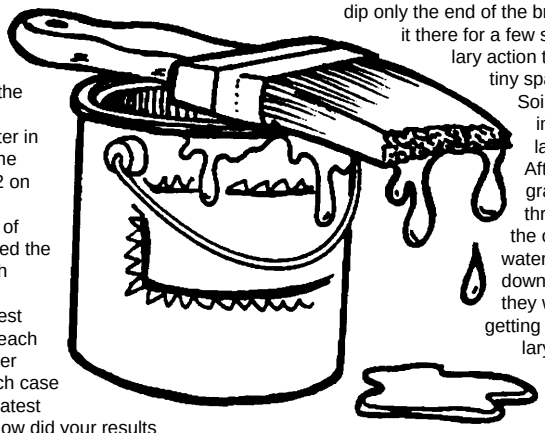
4. For trial one, fill the glass with exactly 1 inch (2.5cm) of water and get ready to time.

5. Immerse, or dip, the strip into the water and hold it steady so the water just touches the 1 inch (2.5cm) line. Start timing as soon as you dip the paper, keeping it in for exactly 1 minute (diagram 2). What's happening to the water?

6. After 1 minute, remove the strip of paper towel and measure the distance the water has traveled above the line. Record this measurement on the data sheet under Trial 1. Using the ruler, measure how much water is still in the glass. Be as accurate as possible. Record this number on the data sheet under Trial 1.

7. Repeat steps 4 through 6, testing each of the three brands of paper towel.

8. Change the conditions of the experiment to see if immersing the paper towel to a greater depth of water changes its ability to absorb water. Using the strips you set aside, draw a line 2 inches (5cm) from each bottom and repeat the experiment using 2 inches (5cm) of water in the glass. Record the results under Trial 2 on the data sheet.



9. Which brand of paper towel absorbed the water fastest in both trials? Which brand absorbed the greatest volume of water in each trial? Did the "quicker picker upper" in each case also absorb the greatest volume of water? How did your results compare with your predictions? What differences in the way the different brands look or feel might help to explain your results? What can you conclude about a paper towel's absorbency and its structure?

Wrap-up

The speed at which something absorbs water does not necessarily reflect the total volume of water that it can hold. Sometimes the slower picker upper will hold a greater volume of water because it is thicker and has a greater amount of space between paper fibers to fill up. We call these spaces pores, and porosity is the measure of how much total space is present. Generally speaking, the quicker picker upper will be thinner and will have fewer pores, but they will be better connected.

What's going on here?

To be useful, paper towels must be able to hold a lot of water and pick it up fast. To do this, they combine porosity and capillary action. Paper is made from a mixture of fibers from things like wood, paper and rags. After being ground into a pulp with water, the fibers are pressed together and allowed to dry. Some paper, like paper towels, has many large holes or pores left between the fibers. The more holes, the greater the porosity and the more water it will hold. If you have ever tried to soak up a spill with a piece of notebook paper, you know that it's fairly difficult. That's because the fibers in writing paper are packed really tightly together giving it a low porosity. But the resulting smooth surface makes notebook paper good for writing on.

If you have ever looked closely at a straw in a glass of water, you may have noticed that the water rises up the straw slightly higher than the water in the glass. That's because the water molecules are attracted to the inside of the straw more strongly than to each other. We call this force of attraction between two different materials adhesion. As the water sticks to the inside of the straw, it pulls other water molecules along with it (a force called cohesion) so it rises up the tube slightly. The narrower the tube, the higher the water will rise, or in other words, the greater the capillary action. In paper towels, the pores are designed to maximize these attractive forces. The pores act like straws pulling water along until the whole towel is wet. Once all the pores are full, they have become saturated and capillary action slows down or even stops.

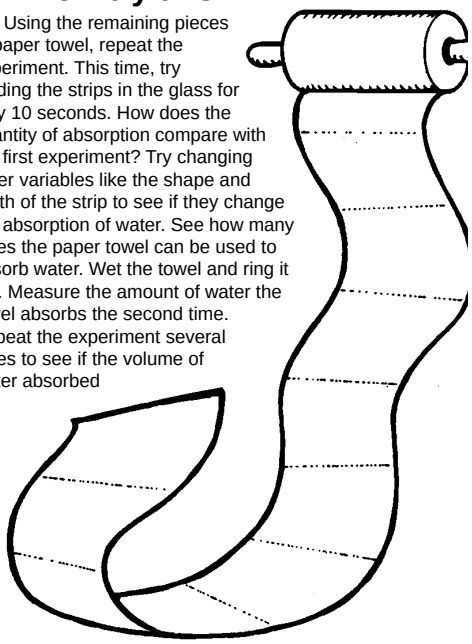
Where does this happen in real life?

The combination of capillary action and porosity works in many different places to help different materials absorb and hold moisture. Have you ever watched professional painters at work? They usually dip only the end of the brush into the paint and hold it there for a few seconds. This allows capillary action to "pull" the paint up into the tiny spaces between the bristles.

Soil is probably one of the most important places where capillary action works in nature. After a rainstorm, the force of gravity pulls water down through the soil. If gravity was the only force acting on the water, it would continue to seep down below the plant roots and they would have a hard time getting a drink. Because of capillary action, however, water is also pulled up through the soil against the force of gravity, keeping the root zone moist. Sandy soils do a poor job of holding moisture because they have very little capillary action, since the pores between grains are too large. Clay soils, on the other hand, take a long time to dry out because they have tiny pores that hold the water tight.

Now try this

Using the remaining pieces of paper towel, repeat the experiment. This time, try holding the strips in the glass for only 10 seconds. How does the quantity of absorption compare with the first experiment? Try changing other variables like the shape and width of the strip to see if they change the absorption of water. See how many times the paper towel can be used to absorb water. Wet the towel and ring it out. Measure the amount of water the towel absorbs the second time. Repeat the experiment several times to see if the volume of water absorbed



This month in history

April

1789 — George Washington is inaugurated as the first U.S. president

1869 — The American Museum of Natural History opens in the city of New York

1881 — Billy the Kid escapes from the Mesilla, N.M., jail after killing the two deputies on guard

1906 — An earthquake (measured at 8.3 on the Richter scale) and fire devastate San Francisco

1942 — The Bataan Death March of some 70,000 U.S. and Philippine prisoners begins

1943 — Albert Hoffman accidentally discovers the hallucinogenic effects of lysergic acid diethylamide

1951 — Gen. Douglas MacArthur is removed from his Korean command for making unauthorized policy statements

1961 — Criticality is achieved by LAMPRE (Los Alamos Molten Plutonium Reactor), a test reactor used to evaluate the feasibility of using plutonium as a fuel in the liquid, rather than the solid, state

1976 — A solar-heated prototype home is installed at TA-46 to be studied for the performance of its flat-plate panels and heat storage system

1983 — The J. Robert Oppenheimer Study Center is dedicated with the main speech delivered by Sen. Pete Domenici, R-N.M.

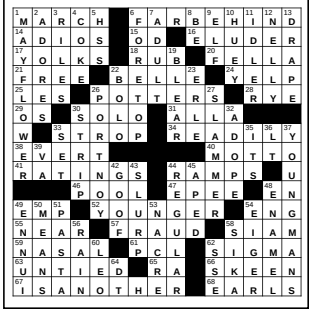
1997 — Construction resumes on the Dual-Axis Radiographic Hydrotest (DARHT) Facility following a 12-day safety stand-down

1998 — The Laboratory's National High Magnetic Field Center is established at TA-35 as part of a national magnetic research program

Syndicated material

Removed at the request of the syndicate

March solution



spotlight

The buzz on 'Mozambeekeepers'

by James E. Rickman

Shortly after arriving in Mozambique, Tim Haarmann, an entomologist in Ecology (ESH-20), found that he had something in common with some of the country's witch doctors: They, too, specialized in beekeeping.

Haarmann found himself in southeast Africa for five weeks last fall as part of a community service project with ACDI/VOCA — a United States Agency for International Development funded nonprofit organization concerned with opening economic opportunities for farmers and entrepreneurs worldwide — and with Food for the Hungry International, an organization concerned with helping the hungry in developing countries.

"They were looking for a beekeeping specialist to train farmers in Mozambique about appropriate technologies for beekeeping," said Haarmann, who is vice president of the New Mexico Beekeeper's Association and who uses bees to track the migration of Laboratory contaminants. "They also were looking for someone who could help the farmers organize cooperatives that would allow them to sell their honey for more profit and improve the beekeeping industry."

But bees in Mozambique have their own mystique, for they are the original "Killer Bees," highly aggressive insects that have been known to sting people and animals to death.

"Earlier in my life, I spent two years in the Peace Corps in Paraguay where they had Africanized bees," said Haarmann, "and one time I took 80 stings from an Africanized swarm. So, fortunately, I had experienced these types of bees before, and I knew what to expect. And they are *mean*."

Haarmann worked with beekeepers in the Gorongosa Mountains of Mozambique. The area, Haarmann said, was a stark contrast to other areas of the country. Civil wars that ended earlier in the decade have left their mark, and much of the country remains war ravaged. In addition, Mozambique is pocked with land mines left over from the wars.

"The mine thing always looms in the back of your mind," Haarmann said.

Unlike the lowlands, the Gorongosa Mountain region has most of its jungles intact. In this area, more than 60 percent of the farmers keep bees. But because of the Killer Bees' nasty reputation, local beekeepers had adopted a hands-off method for harvesting honey.

Traditional local bee farmers hang hives made of bark or hollow logs from trees. Eventually swarms take up residence in the hives. Once the hives mature, the local beekeepers build smoky fires under them to drive away the bees. They then collect the honey — which generally is of low quality because it is smoky or immature — and sell it to brokers. The brokers then turn around and sell the honey in nearby villages for huge profits. Beekeepers don't travel to villages themselves because of lack of transportation.

Haarmann introduced jungle beekeepers to gloves, net veils and hand-held smokers — the tools of the Western beekeeping trade. He taught them how to apply for grants to procure the equipment. He also introduced them to hives that allow beekeepers to regulate honey production and gather better-quality honey. Finally, he taught them how to actively manage their hives.

"I was amazed at how much the locals knew," he said. "They knew bee biology backwards and forwards. They knew everything about flowers. They knew tons about bees in general. But they thought I was nuts when I'd actually open a hive and start trying to find the queen or start moving honey combs around."

Haarmann said despite his getting stung 15 times a day during his demonstrations and workshops, bee farmers soon learned that they could work with the Killer Bees, and they embraced the improved concepts and methods. After that, Haarmann found a honey buyer who had an established market but not enough of a supply to meet the demands of his customers. The beekeepers formed a cooperative that would work collectively to supply the buyer with quality honey.

"The beekeepers are going to make more money working with this buyer," he said.

Haarmann's project was so successful that it was voted by ACDI/VOCA officials as one of the top projects out of the 600 sponsored by the organization in 1998, and late last year Haarmann traveled to Washington to receive a distinguished service award.

"This was a great experience, and I'm serious about doing a lifetime's worth of these projects," he said. "It makes you feel like you're doing something to make people's lives better."

It's a sentiment that gives Haarmann something else in common with the witch doctors.

Tim Haarman

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